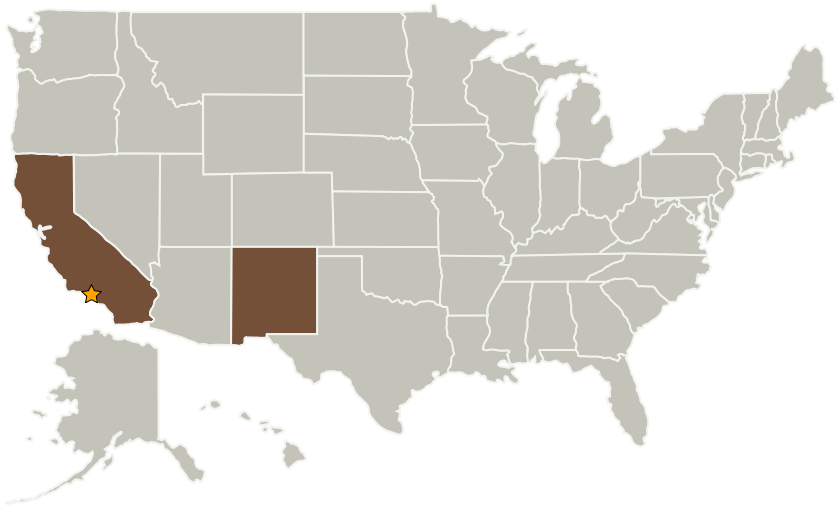
Polarimeter on a Chip: Antenna-Coupled Microbolometers and Polarimeters for Submillimeterwave and Millimeterwave Focal Planes, Phase I

Completed Technology Project (2006 - 2006)

Project Introduction

Future missions to study astrophysical sources at millimeter and submillimeter wavelengths require focal planes of 1000's of detectors that must operate at the background limit from cooled telescopes in space, couple efficiently to optical systems spanning wavelengths from 1 cm to 0.1 mm, allow precise measurements of polarization, and interface with a suitable readout technology. These properties are critical, for example, for missions to decode completely the temperature and polarization of the 2.7 K cosmic microwave background radiation, such as the Einstein Inflation Probe (EIP, or CMBPol). Achieving these goals will require a revolution in detector technology, and scalable approaches that are compatible with planar microlithographic fabrication are therefore essential. The most promising schemes include antenna-coupled bolometers cooled to ~100 mK. We propose to develop the superconducting transition-edge hot-electron microbolometer (THM), which overcomes many of the limitations of current bolometer technology. Using superconducting transmission-line circuitry for focal-plane processing of the RF signal, we propose to integrate these detectors into a polarimeter on a single, monolithic circuit. The innovation directly addresses Topic 4 "Exploration of the Universe Beyond Our Solar System," subtopic S4.01 "Infrared and Sub-mm Sensors and Detectors."

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
STAR Cryoelectronics, LLC	Supporting Organization	Industry	Santa Fe, New Mexico

Primary U.S. Work Locations	
California	New Mexico

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes